#9

SEQUENCE LISTING

<110> YAMAMOTO, Takuo
MARUTA, Kazuhiko
KUBOTA, Michio
FUKUDA, Shigeharu
MIYAKE, Toshio

<120> NON-REDUCING SACCHARIDE-FORMING ENZYME, TREHALOSE-RELEASING ENZYME, AND PROCESS FOR PRODUCING SACCHARIDES USING THE ENZYMES

<130> YAMAMOTO=16A

<140> 09/435,770
<141> 1999-11-08

<150> JP 258,394/1998
<151> 1998-09-11

<150> JP 352,252/1998
<151> 1998-12-11

<150> JP 16,931/1999
<151> 1999-01-26

<160> 39

<170> PatentIn Ver. 2.1

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Leu Tyr Leu Ser Pro Leu Leu Glu Ser Glu Ser Gly Ser Ser His Gly
        35                  40                  45

Tyr Asp Val Val Asp His Ser Arg Val Asp Ala Ala Arg Gly Gly Pro
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Glu Gly Leu Ala Glu Leu Ser Arg Ala Ala His Glu Arg Gly Met Gly
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Val Val Val Asp Ile Val Pro Asn His Val Gly Val Ala Thr Pro Lys
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1/22

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Tyr Ala Asp Tyr Phe Asp Ile Asp Trp Glu Phe Gly Gly Gly Arg Leu
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Arg Leu Pro Val Leu Gly Asp Gly Pro Asp Glu Leu Asp Ala Leu Arg
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Val Asp Gly Asp Glu Leu Val Tyr Tyr Glu His Arg Phe Pro Ile Ala
145                 150                 155                 160

Glu Gly Thr Gly Gly Gly Thr Pro Arg Glu Val His Asp Arg Gln His
                165                 170                 175

Tyr Glu Leu Met Ser Trp Arg Arg Ala Asp His Asp Leu Asn Tyr Arg
           180                 185                 190

Arg Phe Phe Ala Val Asn Thr Leu Ala Ala Val Arg Val Glu Asp Pro
       195                 200                 205

Arg Val Phe Asp Asp Thr His Arg Glu Ile Gly Arg Trp Ile Ala Glu
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Gly Leu Val Asp Gly Leu Arg Val Asp His Pro Asp Gly Leu Arg Ala
225                 230                 235                 240

Pro Gly Asp Tyr Leu Arg Arg Leu Ala Glu Leu Ala Gln Gly Arg Pro
                245                 250                 255

Ile Trp Val Glu Lys Ile Ile Glu Gly Asp Glu Arg Met Pro Pro Gln
           260                 265                 270

Trp Pro Ile Ala Gly Thr Thr Gly Tyr Asp Ala Leu Ala Gly Ile Asp
       275                 280                 285

Arg Val Leu Val Asp Pro Ala Gly Glu His Pro Leu Thr Gln Ile Val
   290                 295                 300

Asp Glu Ala Ala Gly Ser Pro Arg Arg Trp Ala Glu Leu Val Pro Glu
305                 310                 315                 320

Arg Lys Arg Ala Val Ala Arg Gly Ile Leu Asn Ser Glu Ile Arg Arg
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Val Ala Arg Glu Leu Gly Glu Val Ala Gly Asp Val Glu Asp Ala Leu
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Val Glu Ile Ala Ala Ala Leu Ser Val Tyr Arg Ser Tyr Leu Pro Phe
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Gly Arg Glu His Leu Asp Glu Ala Val Ala Ala Ala Gln Ala Ala Ala
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Pro Gln Leu Glu Ala Asp Leu Ala Ala Val Gly Ala Ala Leu Ala Asp
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Pro Gly Asn Pro Ala Ala Leu Arg Phe Gln Gln Thr Ser Gly Met Ile
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Met Ala Lys Gly Val Glu Asp Asn Ala Phe Tyr Arg Tyr Pro Arg Leu
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Thr Ser Leu Thr Glu Val Gly Gly Asp Pro Ser Leu Phe Ala Ile Asp
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Ala Ala Ala Phe His Ala Ala Gln Arg Asp Arg Ala Ala Arg Leu Pro
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Glu Ser Met Thr Thr Leu Thr Thr His Asp Thr Lys Arg Ser Glu Asp
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Arg Phe Leu Thr Glu Val Gly Gly Leu Ile Gly Thr Gly Asp Arg Val
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Leu Glu Asn Leu Ile Trp Gln Ala Ile Val Gly Ala Trp Pro Ala Ser
515 520 525

Arg Glu Arg Leu Glu Ala Tyr Ala Leu Lys Ala Ala Arg Glu Ala Gly
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Glu Ser Thr Asp Trp Ile Asp Gly Asp Pro Ala Phe Glu Glu Arg Leu
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Leu Ala Ala Lys Leu Leu Gln Leu Leu Ala Pro Gly Thr Pro Asp Val
595 600 605

Tyr Gln Gly Thr Glu Arg Trp Asp Arg Ser Leu Val Asp Pro Asp Asn
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Arg Arg Pro Val Asp Phe Ala Ala Ala Ser Glu Leu Leu Asp Arg Leu
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Asp Gly Gly Trp Arg Pro Pro Val Asp Glu Thr Gly Ala Val Lys Thr
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Leu Val Val Ser Arg Ala Leu Arg Leu Arg Arg Asp Arg Pro Glu Leu
660 665 670

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Phe Thr Ala Tyr His Pro Val Thr Ala Arg Gly Ala Gln Ala Glu His
        675                 680                 685

Leu Ile Gly Phe Asp Arg Gly Gly Ala Ile Ala Leu Ala Thr Arg Leu
    690                 695                 700

Pro Leu Gly Leu Ala Ala Ala Gly Gly Trp Gly Asp Thr Val Val Asp
705                 710                 715                 720

Val Gly Glu Arg Ser Leu Arg Asp Glu Leu Thr Gly Arg Glu Ala Arg
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Gly Ala Ala Arg Val Ala Glu Leu Phe Ala Asp Tyr Pro Val Ala Leu
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Leu Val Glu Thr
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Ser Glu Leu Leu
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Tyr Ala Asp Tyr
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826

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Leu Val Val Gly Gln Gly Arg Ala Glu Leu Pro Leu Thr Arg Asp Glu
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Asn Gly Trp Trp Ala Leu Gln Gln Pro Trp Asp Gly Gly Pro Asp Leu
         35                  40                  45

Val Asp Tyr Gly Tyr Leu Val Asp Gly Lys Gly Pro Phe Ala Asp Pro
     50                  55                  60

Arg Ser Leu Arg Gln Pro Arg Gly Val His Glu Leu Gly Arg Glu Phe
 65                  70                  75                  80

Asp Pro Ala Arg Tyr Ala Trp Gly Asp Asp Gly Trp Arg Gly Arg Asp
                 85                  90                  95

Leu Thr Gly Ala Val Ile Tyr Glu Leu His Val Gly Thr Phe Thr Pro
            100                 105                 110

Glu Gly Thr Leu Asp Ser Ala Ile Arg Arg Leu Asp His Leu Val Arg
        115                 120                 125

Leu Gly Val Asp Ala Val Glu Leu Leu Pro Val Asn Ala Phe Asn Gly
    130                 135                 140

Thr His Gly Trp Gly Tyr Asp Gly Val Leu Trp Tyr Ala Val His Glu
145                 150                 155                 160

Pro Tyr Gly Gly Pro Glu Ala Tyr Gln Arg Phe Val Asp Ala Cys His
                165                 170                 175

Ala Arg Gly Leu Ala Val Val Gln Asp Val Val Tyr Asn His Leu Gly
            180                 185                 190

Pro Ser Gly Asn His Leu Pro Asp Phe Gly Pro Tyr Leu Gly Ser Gly
        195                 200                 205
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Ala Ala Asn Thr Trp Gly Asp Ala Leu Asn Leu Asp Gly Pro Leu Ser
210 215 220

Asp Glu Val Arg Arg Tyr Ile Ile Asp Asn Ala Val Tyr Trp Leu Arg
225 230 235 240

Asp Met His Ala Asp Gly Leu Arg Leu Asp Ala Val His Ala Leu Arg
245 250 255

Asp Ala Arg Ala Leu His Leu Leu Glu Glu Leu Ala Ala Arg Val Asp
260 265 270

Glu Leu Ala Gly Glu Leu Gly Arg Pro Leu Thr Leu Ile Ala Glu Ser
275 280 285

Asp Leu Asn Asp Pro Lys Leu Ile Arg Ser Arg Ala Ala His Gly Tyr
290 295 300

Gly Leu Asp Ala Gln Trp Asp Asp Asp Val His His Ala Val His Ala
305 310 315 320

Asn Val Thr Gly Glu Thr Val Gly Tyr Tyr Ala Asp Phe Gly Gly Leu
325 330 335

Gly Ala Leu Val Lys Val Phe Gln Arg Gly Trp Phe His Asp Gly Thr
340 345 350

Trp Ser Ser Phe Arg Glu Arg His His Gly Arg Pro Leu Asp Pro Asp
355 360 365

Ile Pro Phe Arg Arg Leu Val Ala Phe Ala Gln Asp His Asp Gln Val
370 375 380

Gly Asn Arg Ala Val Gly Asp Arg Met Ser Ala Gln Val Gly Glu Gly
385 390 395 400

Ser Leu Ala Ala Ala Ala Ala Leu Val Leu Leu Gly Pro Phe Thr Pro
405 410 415

Met Leu Phe Met Gly Glu Glu Trp Gly Ala Arg Thr Pro Trp Gln Phe
420 425 430

Phe Thr Ser His Pro Glu Pro Glu Leu Gly Glu Ala Thr Ala Arg Gly
435 440 445

Arg Ile Ala Glu Phe Ala Arg Met Gly Trp Asp Pro Ala Val Val Pro
450 455 460

Asp Pro Gln Asp Pro Ala Thr Phe Ala Arg Ser His Leu Asp Trp Ser
465 470 475 480

Glu Pro Glu Arg Glu Pro His Ala Gly Leu Leu Ala Phe Tyr Thr Asp
485 490 495

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Leu Ile Ala Leu Arg Arg Glu Leu Pro Val Asp Ala Pro Ala Arg Glu
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Val Asp Ala Asp Glu Ala Arg Gly Val Phe Ala Phe Ser Arg Gly Pro
        515                 520                 525

Leu Arg Val Thr Val Ala Leu Arg Pro Gly Pro Val Gly Val Pro Glu
    530                 535                 540

His Gly Gly Leu Val Leu Ala Tyr Gly Glu Val Arg Ala Gly Ala Ala
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Gly Leu His Leu Asp Gly Pro Gly Ala Ala Ile Val Arg Leu Glu
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<210> 13
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Leu Val Val Gly
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Val His His Ala
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820
Ser Ala Glu Phe Thr Leu Phe Asp Ala Ala Arg Ile Val Pro Tyr Leu
15 20 25

cac cgc ctc ggc gcc gac tgg ctg tac ctc tcg ccg ctg ctc gag tcc
868
His Arg Leu Gly Ala Asp Trp Leu Tyr Leu Ser Pro Leu Leu Glu Ser
30 35 40

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916
Glu Ser Gly Ser Ser His Gly Tyr Asp Val Val Asp His Ser Arg Val
45 50 55

gac gcc gcc cgc ggc ggg ccg gag ggg ctc gcc gag ctc tcc cgt gcg
964
Asp Ala Ala Arg Gly Gly Pro Glu Gly Leu Ala Glu Leu Ser Arg Ala
60 65 70

gcg cac gag cgc ggc atg ggc gtc gtc gtc gac atc gtg ccc aac cac
1012
Ala His Glu Arg Gly Met Gly Val Val Val Asp Ile Val Pro Asn His
75 80 85 90

gtc ggc gtc gcg acg ccg aag gcg aac cgc tgg tgg tgg gac gtt ctg
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Val Gly Val Ala Thr Pro Lys Ala Asn Arg Trp Trp Trp Asp Val Leu
95 100 105

gcc cgt gga cag cgg tcg gag tac gcc gac tac ttc gac atc gac tgg
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Ala Arg Gly Gln Arg Ser Glu Tyr Ala Asp Tyr Phe Asp Ile Asp Trp
110 115 120

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Glu Phe Gly Gly Gly Arg Leu Arg Leu Pro Val Leu Gly Asp Gly Pro
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Asp Glu Leu Asp Ala Leu Arg Val Asp Gly Asp Glu Leu Val Tyr Tyr
140 145 150

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155                 160                 165                 170

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Glu Val His Asp Arg Gln His Tyr Glu Leu Met Ser Trp Arg Arg Ala
                175                 180                 185

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1348
Asp His Asp Leu Asn Tyr Arg Arg Phe Phe Ala Val Asn Thr Leu Ala
            190                 195                 200

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Ile Gly Arg Trp Ile Ala Glu Gly Leu Val Asp Gly Leu Arg Val Asp
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His Pro Asp Gly Leu Arg Ala Pro Gly Asp Tyr Leu Arg Arg Leu Ala
235                 240                 245                 250

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Glu Leu Ala Gln Gly Arg Pro Ile Trp Val Glu Lys Ile Ile Glu Gly
                255                 260                 265

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1588
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            270                 275                 280

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1636
Asp Ala Leu Ala Gly Ile Asp Arg Val Leu Val Asp Pro Ala Gly Glu
        285                 290                 295

cat ccg ctc acc cag atc gtc gac gag gcg gca ggc agc ccc cgg cgc
1684
His Pro Leu Thr Gln Ile Val Asp Glu Ala Ala Gly Ser Pro Arg Arg
    300                 305                 310

tgg gcc gag ctg gtt ccc gag cgc aag cgg gcc gtc gcc cgc ggc atc
1732
Trp Ala Glu Leu Val Pro Glu Arg Lys Arg Ala Val Ala Arg Gly Ile
315                 320                 325                 330
```

```
ctg aac tcc gag atc cgc cgc gtc gcc cgc gaa ctc gga gag gtc gcc
1780
Leu Asn Ser Glu Ile Arg Arg Val Ala Arg Glu Leu Gly Glu Val Ala
                335                 340                 345

ggc gac gtc gaa gac gcg ctc gtc gag atc gcc gcc gcc ctg tcc gtc
1828
Gly Asp Val Glu Asp Ala Leu Val Glu Ile Ala Ala Ala Leu Ser Val
            350                 355                 360

tac cgc agc tac ctg ccg ttc ggg cgc gag cac ctc gac gaa gcc gtg
1876
Tyr Arg Ser Tyr Leu Pro Phe Gly Arg Glu His Leu Asp Glu Ala Val
        365                 370                 375

gcc gcc gcg cag gcc gca gcc ccc cag ctc gag gcc gac ctc gcc gcc
1924
Ala Ala Ala Gln Ala Ala Ala Pro Gln Leu Glu Ala Asp Leu Ala Ala
    380                 385                 390

gtc ggc gca gcg ctc gcc gac ccg ggc aac ccc gcc gcg ctc cgc ttc
1972
Val Gly Ala Ala Leu Ala Asp Pro Gly Asn Pro Ala Ala Leu Arg Phe
395                 400                 405                 410

cag cag acc agc ggc atg atc atg gcc aag ggc gtc gag gac aac gcg
2020
Gln Gln Thr Ser Gly Met Ile Met Ala Lys Gly Val Glu Asp Asn Ala
                415                 420                 425

ttc tac cgc tac ccc cgg ctc acc tcg ctg acc gag gtc ggg gga gac
2068
Phe Tyr Arg Tyr Pro Arg Leu Thr Ser Leu Thr Glu Val Gly Gly Asp
            430                 435                 440

ccg agc ctg ttc gcg atc gac gcg gcc gcc ttc cac gcg gcg cag cgc
2116
Pro Ser Leu Phe Ala Ile Asp Ala Ala Ala Phe His Ala Ala Gln Arg
        445                 450                 455

gac cgc gcc gcc cgg ctg ccc gag tcg atg acg acg ctg acc acc cac
2164
Asp Arg Ala Ala Arg Leu Pro Glu Ser Met Thr Thr Leu Thr Thr His
    460                 465                 470

gac acc aag cgc agc gaa gac acc cgg gcg cgg atc acc gcg ctc gcc
2212
Asp Thr Lys Arg Ser Glu Asp Thr Arg Ala Arg Ile Thr Ala Leu Ala
475                 480                 485                 490

gag gcc ccc gaa cgc tgg cgg cgc ttc ctg acc gag gtc ggc ggg ctc
2260
Glu Ala Pro Glu Arg Trp Arg Arg Phe Leu Thr Glu Val Gly Gly Leu
                495                 500                 505
```

```
atc gga acg ggc gac cgg gtg ctg gag aac ctg atc tgg cag gcg atc
2308
Ile Gly Thr Gly Asp Arg Val Leu Glu Asn Leu Ile Trp Gln Ala Ile
            510                 515                 520

gtc ggc gcg tgg ccg gcg agc cgg gag cgg ctc gag gcc tac gcg ctg
2356
Val Gly Ala Trp Pro Ala Ser Arg Glu Arg Leu Glu Ala Tyr Ala Leu
        525                 530                 535

aag gcc gcg cgc gaa gcc ggc gag tcg acc gac tgg atc gac ggc gac
2404
Lys Ala Ala Arg Glu Ala Gly Glu Ser Thr Asp Trp Ile Asp Gly Asp
    540                 545                 550

ccc gcg ttc gaa gag cgg ctg acc cgc ctg gtc acg gtc gcc gtc gag
2452
Pro Ala Phe Glu Glu Arg Leu Thr Arg Leu Val Thr Val Ala Val Glu
555                 560                 565                 570

gag ccg ctc gtg cac gag ctg ctc gag cgg ctc gtc gac gag ctg acg
2500
Glu Pro Leu Val His Glu Leu Leu Glu Arg Leu Val Asp Glu Leu Thr
                575                 580                 585

gcg gcc ggg tac tcc aac ggc ctc gcg gcg aag ctg ctg cag ctg ctc
2548
Ala Ala Gly Tyr Ser Asn Gly Leu Ala Ala Lys Leu Leu Gln Leu Leu
            590                 595                 600

gcc ccc gga acc ccc gac gtg tac cag ggc acg gaa cgc tgg gac cgg
2596
Ala Pro Gly Thr Pro Asp Val Tyr Gln Gly Thr Glu Arg Trp Asp Arg
        605                 610                 615

tcg ctg gtg gac ccg gac aac cgt cgc ccc gtg gat ttc gcc gcg gca
2644
Ser Leu Val Asp Pro Asp Asn Arg Arg Pro Val Asp Phe Ala Ala Ala
    620                 625                 630

tcc gag ctg ctc gac cgc ctc gac ggc ggc tgg cgg ccg ccc gtc gac
2692
Ser Glu Leu Leu Asp Arg Leu Asp Gly Gly Trp Arg Pro Pro Val Asp
635                 640                 645                 650

gag acc ggc gcg gtc aag acg ctc gtc gtc tcc cgc gcg ctg cgg ctg
2740
Glu Thr Gly Ala Val Lys Thr Leu Val Val Ser Arg Ala Leu Arg Leu
                655                 660                 665

cgc cgc gac cgg ccc gag ctg ttc acc gcg tac cac ccg gtc acg gcg
2788
Arg Arg Asp Arg Pro Glu Leu Phe Thr Ala Tyr His Pro Val Thr Ala
            670                 675                 680
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cgc ggc gcg cag gcc gag cac ctg atc ggc ttc gac cgc ggc ggc gcg
2836
Arg Gly Ala Gln Ala Glu His Leu Ile Gly Phe Asp Arg Gly Gly Ala
685 690 695

atc gcc ctg gcc acc cgc ctg ccg ctc ggc ctc gcc gcc gca ggc ggc
2884
Ile Ala Leu Ala Thr Arg Leu Pro Leu Gly Leu Ala Ala Ala Gly Gly
700 705 710

tgg ggc gac acg gtc gtc gac gtc ggc gag cgg agc ctg cgc gac gag
2932
Trp Gly Asp Thr Val Val Asp Val Gly Glu Arg Ser Leu Arg Asp Glu
715 720 725 730

ctg acc ggc cgc gag gcc cgc gga gcg gcg cgc gtg gcc gag ttg ttc
2980
Leu Thr Gly Arg Glu Ala Arg Gly Ala Ala Arg Val Ala Glu Leu Phe
735 740 745

gcc gac tac ccc gtc gcc ctg ctg gtg gag aca tgaaccgacg attcccggtc
3033
Ala Asp Tyr Pro Val Ala Leu Leu Val Glu Thr
750 755

tgggcgcccc aggccgcgca ggtgacgctc gtcgtgggcc aaggccgcgc cgaactcccg
3093

ctgacccgcg acgagaacgg atggtgggct cttcagcagc cgtgggacgg cggccccgac
3153

ctcgtcgact acggctacct cgtcgacggc aagggcccct tcgccgaccc gcggtcgctg
3213

cggcagccgc gcggcgtgca cgagctcggc cgcgaattc
3252

<210> 20
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 20
atgcccgcca gtacctaccg ccttca
26

<210> 21
<211> 25
<212> DNA

<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 21
tcatgtctcc accagcaggg cgacg
25

<210> 22
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 22
aattcttttt taataaaatc aggaggaatc tagatgttta ctagtctgca
50

<210> 23
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 23
gactagtaaa catctagatt cctcctgatt ttattaaaaa ag
42

<210> 24
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 24
aaatctagat gcccgccagt acctaccgcc ttc
33

<210> 25
<211> 33
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:SYNTHETIC

<400> 25
aaaactagtt tatcatgtct ccaccagcag ggc
33

<210> 26
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 26
atcggtgatg tcggcgatat ag
22

<210> 27
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 27
gtactggcgg gcatattttt tcctcctga
29

<210> 28
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 28
aatcaggagg aaaaaatatg cccgccagta c
31

<210> 29
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 29

tcgacgatct gggtgagcgg at
22

<210> 30
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 30
tcgacgagca cccggtcgat cc
22

<210> 31
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 31
cartgggayg aygaygtnca ycaygc
26

<210> 32
<211> 2218
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<220>
<221> CDS
<222> (477)..(2201)

<220>
<221> 3'UTR
<222> (2202)..(2218)

<400> 33
ctgcagctgc tcgcccccgg aacccccgac gtgtaccagg gcacggaacg ctgggaccgg
60

tcgctggtgg acccggacaa ccgtcgcccc gtggatttcg ccgcggcatc cgagctgctc
120

gaccgcctcg acggcggctg gcggccgccc gtcgacgaga ccggcgcggt caagacgctc
180

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gtcgtctccc gcgcgctgcg gctgcgccgc gaccggcccg agctgttcac cgcgtaccac
240

ccggtcacgg cgcgcggcgc gcaggccgag cacctgatcg gcttcgaccg cggcggcgcg
300

atcgccctgg ccacccgcct gccgctcggc ctcgccgccg caggcggctg gggcgacacg
360

gtcgtcgacg tcggcgagcg gagcctgcgc gacgagctga ccggccgcga ggcccgcgga
420

gcggcgcgcg tggccgagtt gttcgccgac taccccgtcg ccctgctggt ggagac atg
479
                                                                Met
                                                                  1

aac cga cga ttc ccg gtc tgg gcg ccc cag gcc gcg cag gtg acg ctc
527
Asn Arg Arg Phe Pro Val Trp Ala Pro Gln Ala Ala Gln Val Thr Leu
               5                  10                  15

gtc gtg ggc caa ggc cgc gcc gaa ctc ccg ctg acc cgc gac gag aac
575
Val Val Gly Gln Gly Arg Ala Glu Leu Pro Leu Thr Arg Asp Glu Asn
          20                  25                  30

gga tgg tgg gct ctt cag cag ccg tgg gac ggc ggc ccc gac ctc gtc
623
Gly Trp Trp Ala Leu Gln Gln Pro Trp Asp Gly Gly Pro Asp Leu Val
      35                  40                  45

gac tac ggc tac ctc gtc gac ggc aag ggc ccc ttc gcc gac ccg cgg
671
Asp Tyr Gly Tyr Leu Val Asp Gly Lys Gly Pro Phe Ala Asp Pro Arg
 50                  55                  60                  65

tcg ctg cgg cag ccg cgc ggc gtg cac gag ctc ggc cgc gaa ttc gac
719
Ser Leu Arg Gln Pro Arg Gly Val His Glu Leu Gly Arg Glu Phe Asp
                70                  75                  80

ccc gcc cgc tac gcg tgg ggc gac gac gga tgg cgc ggc cga gac ctc
767
Pro Ala Arg Tyr Ala Trp Gly Asp Asp Gly Trp Arg Gly Arg Asp Leu
               85                  90                  95

acc gga gcc gtg atc tac gaa ctg cac gtc ggc acc ttc acc cct gag
815
Thr Gly Ala Val Ile Tyr Glu Leu His Val Gly Thr Phe Thr Pro Glu
          100                 105                 110

gga acg ctg gac agc gcc atc cgt cgc ctc gac cac ctg gtg cgc ctc
863
Gly Thr Leu Asp Ser Ala Ile Arg Arg Leu Asp His Leu Val Arg Leu
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    115                 120                 125

ggc gtc gac gcg gtc gag ctg ctg ccc gtc aac gcg ttc aac ggc acc
911
Gly Val Asp Ala Val Glu Leu Leu Pro Val Asn Ala Phe Asn Gly Thr
130                 135                 140                 145

cac ggc tgg ggc tac gac ggg gtg ctc tgg tac gcg gtg cac gag ccc
959
His Gly Trp Gly Tyr Asp Gly Val Leu Trp Tyr Ala Val His Glu Pro
                150                 155                 160

tac ggc ggc ccg gag gcg tac cag cgc ttc gtc gac gcc tgc cac gcc
1007
Tyr Gly Gly Pro Glu Ala Tyr Gln Arg Phe Val Asp Ala Cys His Ala
            165                 170                 175

cgc ggc ctc gcc gtc gtg cag gac gtc gtc tac aac cac ctg ggc ccg
1055
Arg Gly Leu Ala Val Val Gln Asp Val Val Tyr Asn His Leu Gly Pro
        180                 185                 190

agc ggc aac cac ctg ccc gac ttc ggc ccc tac ctc ggg tcg ggc gcc
1103
Ser Gly Asn His Leu Pro Asp Phe Gly Pro Tyr Leu Gly Ser Gly Ala
    195                 200                 205

gcc aac acc tgg ggc gac gcg ctg aac ctc gac ggg ccg ctc tcc gac
1151
Ala Asn Thr Trp Gly Asp Ala Leu Asn Leu Asp Gly Pro Leu Ser Asp
210                 215                 220                 225

gag gtg cgg cgg tac atc atc gac aac gcg gtg tac tgg ctg cgc gac
1199
Glu Val Arg Arg Tyr Ile Ile Asp Asn Ala Val Tyr Trp Leu Arg Asp
                230                 235                 240

atg cac gcc gac ggg ctg cgg ctc gac gcc gtg cac gcg ctg cgc gac
1247
Met His Ala Asp Gly Leu Arg Leu Asp Ala Val His Ala Leu Arg Asp
            245                 250                 255

gcc cgc gcg ctg cac ctg ctc gaa gag ctc gcc gcc cgc gtc gac gag
1295
Ala Arg Ala Leu His Leu Leu Glu Glu Leu Ala Ala Arg Val Asp Glu
        260                 265                 270

ctg gcg ggc gag ctc ggc cgg ccg ctg acg ctc atc gcc gag agc gac
1343
Leu Ala Gly Glu Leu Gly Arg Pro Leu Thr Leu Ile Ala Glu Ser Asp
    275                 280                 285

ctg aac gac ccg aag ctg atc cgc tcc cgc gcg gcg cac ggc tac ggc
1391
Leu Asn Asp Pro Lys Leu Ile Arg Ser Arg Ala Ala His Gly Tyr Gly
```

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290                 295                 300                 305

ctc gac gcc cag tgg gac gac gac gtg cac cac gcg gtg cac gcc aac
1439
Leu Asp Ala Gln Trp Asp Asp Asp Val His His Ala Val His Ala Asn
                310                 315                 320

gtg acc ggc gag acc gtc ggc tac tac gcc gac ttc ggc ggg ctc ggc
1487
Val Thr Gly Glu Thr Val Gly Tyr Tyr Ala Asp Phe Gly Gly Leu Gly
            325                 330                 335

gcc ctc gtc aag gtg ttc cag cgc ggc tgg ttc cac gac ggc acc tgg
1535
Ala Leu Val Lys Val Phe Gln Arg Gly Trp Phe His Asp Gly Thr Trp
        340                 345                 350

tcg agc ttc cgc gag cgg cac cac ggc cgg ccg ctc gac ccc gac atc
1583
Ser Ser Phe Arg Glu Arg His His Gly Arg Pro Leu Asp Pro Asp Ile
    355                 360                 365

ccg ttc cgc cgg ctc gtc gcc ttc gcg cag gat cac gac cag gtc ggc
1631
Pro Phe Arg Arg Leu Val Ala Phe Ala Gln Asp His Asp Gln Val Gly
370                 375                 380                 385

aac cga gcg gtc ggc gac cgc atg tcg gcg cag gtc ggc gag ggt tcg
1679
Asn Arg Ala Val Gly Asp Arg Met Ser Ala Gln Val Gly Glu Gly Ser
                390                 395                 400

ctc gcc gcc gcg gcg gcg ctc gtg ctg ctc ggc ccg ttc acc ccg atg
1727
Leu Ala Ala Ala Ala Ala Leu Val Leu Leu Gly Pro Phe Thr Pro Met
            405                 410                 415

ctg ttc atg ggc gag gag tgg ggc gcg cgc acc ccg tgg cag ttc ttc
1775
Leu Phe Met Gly Glu Glu Trp Gly Ala Arg Thr Pro Trp Gln Phe Phe
        420                 425                 430

acc tcc cac ccc gag ccc gag ctg ggg gag gcg acg gcg cgc ggg cgc
1823
Thr Ser His Pro Glu Pro Glu Leu Gly Glu Ala Thr Ala Arg Gly Arg
    435                 440                 445

atc gcc gag ttc gcc cgc atg ggc tgg gac ccg gca gtc gtg ccc gac
1871
Ile Ala Glu Phe Ala Arg Met Gly Trp Asp Pro Ala Val Val Pro Asp
450                 455                 460                 465

ccg cag gac ccg gcc acc ttc gcc cgc tcg cac ctg gac tgg tcc gag
1919
Pro Gln Asp Pro Ala Thr Phe Ala Arg Ser His Leu Asp Trp Ser Glu
```

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                470                 475                 480

ccc gag cgg gaa ccg cac gcg ggc ctg ctc gcc ttc tac acc gac ctg
1967
Pro Glu Arg Glu Pro His Ala Gly Leu Leu Ala Phe Tyr Thr Asp Leu
            485                 490                 495

atc gcg ctg cgg cgc gag ctg ccg gtc gat gcg ccg gcg cgc gag gtg
2015
Ile Ala Leu Arg Arg Glu Leu Pro Val Asp Ala Pro Ala Arg Glu Val
        500                 505                 510

gat gcc gac gag gcg cgc ggc gtc ttc gcg ttc agc cgc ggc ccg ctg
2063
Asp Ala Asp Glu Ala Arg Gly Val Phe Ala Phe Ser Arg Gly Pro Leu
    515                 520                 525

cgg gtc acg gtc gcg ctg cgc ccc gga ccg gtc ggg gtg ccc gag cac
2111
Arg Val Thr Val Ala Leu Arg Pro Gly Pro Val Gly Val Pro Glu His
530                 535                 540                 545

ggg ggc ctc gtg ctc gcc tac ggc gag gtg cgc gcc ggc gcc gcc gga
2159
Gly Gly Leu Val Leu Ala Tyr Gly Glu Val Arg Ala Gly Ala Ala Gly
                550                 555                 560

ctg cac ctc gac ggg ccg gga gcc gcg atc gtg cgc ctc gag
2201
Leu His Leu Asp Gly Pro Gly Ala Ala Ile Val Arg Leu Glu
            565                 570                 575

tgacgcggct gggtacc
2218
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<210> 33
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 33
atgaaccgac gattcccggt ctggg
25

<210> 34
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 34
tcactcgagg cgcacgatcg cggct
25

<210> 35
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 35
aaatctagat gaaccgacga ttcccggtct gggcgc
36

<210> 36
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 36
aaaactagtt tatcactcga ggcgcacgat cgcggc
36

<210> 37
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 37
atcgtcggtt catatttttt cctcctga
28

<210> 38
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 38
aatcaggagg aaaaaatatg aaccgacg
28

<210> 39
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC

<400> 39
aggtggttgt agacgacgtc ct
22